What Is Claimed Is:

1. A process for improving the performance characteristics of a catalyst, comprising the steps of:

a) providing precursors for a mixed metal oxide having the empirical formula

$$J_jM_mN_nY_yZ_zO_o$$

wherein J is at least one element selected from the group consisting of Mo and W, M is at least one element selected from the group consisting of V and Ce, N is at least one element selected from the group consisting of Te, Sb and Se, Y is at least one element selected from the group consisting of Nb, Ta, Ti, Al, Zr, Cr, Mn, Fe, Ru, Co, Rh, Ni, Pt, Sb, Bi, B, In, As, Ge, Sn, Li, Na, K, Rb, Cs, Fr, Be, Mg, Ca, Sr, Ba, Ra, Hf, Pb, P, Pm, Eu, Gd, Dy, Ho, Er, Tm, Yb and Lu, and Z is selected from the group consisting of Ni, Pd, Cu, Ag and Au; and wherein, when j = 1, m = 0.01 to 1.0, n = 0.01 to 1.0, y = 0.01 to 1.0, z = 0.001 to 0.1 and o is dependent on the oxidation state of the other elements;

b) adding a source of NO_x to said precursors to form an admixture; and

c) calcining said admixture while said NO_x is present in said admixture.

2. The process according to claim 1, wherein said source of NO_x is selected from nitric acid, ammonium nitrate, ammonium nitrite, NO, NO_2 or a mixture thereof.

3. The process according to claim 1, wherein said source of NO_x is nitric acid.

4. The process according to claim 1, wherein said providing step (a) includes forming an admixture of metal compounds, at least one of which contains oxygen, in at least one solvent.

5. The process according to claim 1, wherein said adding step (b) includes adding said source of NO_x in a gaseous state.

6. A process for producing an unsaturated carboxylic acid, which comprises subjecting an alkane or a mixture of an alkane and an alkene to a vapor phase catalytic oxidation reaction in the presence of a catalyst containing a mixed metal oxide having the empirical formula

$$J_jM_mN_nY_yZ_zO_o$$

wherein J is at least one element selected from the group consisting of Mo and W, M is at least one element selected from the group consisting of V and Ce, N is at least one element selected from the group consisting of Te, Sb and Se, Y is at least one element selected from the group consisting of Nb, Ta, Ti, Al, Zr, Cr, Mn, Fe, Ru, Co, Rh, Ni, Pt, Sb, Bi, B, In, As, Ge, Sn, Li, Na, K, Rb, Cs, Fr, Be, Mg, Ca, Sr, Ba, Ra, Hf, Pb, P, Pm, Eu, Gd, Dy, Ho, Er, Tm, Yb and Lu, and Z is selected from the group consisting of Ni, Pd, Cu, Ag and Au; and wherein, when j = 1, m = 0.01 to 1.0, n = 0.01 to 1.0, y = 0.01 to 1.0, z = 0.001 to 0.1 and o is dependent on the oxidation state of the other elements, said catalyst composition having been formed from calcining an admixture including catalyst precursors and a source of NO_x for improving catalytic performance.

7. The process according to claim 6, wherein said source of NO_x is selected from nitric acid, ammonium nitrate, ammonium nitrite, NO, NO_2 or a mixture thereof.

8. The process according to claim 6, wherein said source of NO_x is nitric acid.

9. A process for producing an unsaturated nitrile, which comprises subjecting an alkane, or a mixture of an alkane and an alkene, and ammonia to a vapor phase catalytic oxidation reaction in the presence of a catalyst containing a mixed metal oxide having the empirical formula

$$J_jM_mN_nY_yZ_zO_o$$

wherein J is at least one element selected from the group consisting of Mo and W, M is at least one element selected from the group consisting of V and Ce, N is at least one element selected from the group consisting of Te, Sb and Se, Y is at least one element selected from the group consisting of Nb, Ta, Ti, Al, Zr, Cr, Mn, Fe, Ru, Co, Rh, Ni, Pt, Sb, Bi, B, In, As, Ge, Sn, Li, Na, K, Rb, Cs, Fr, Be, Mg, Ca, Sr, Ba, Ra, Hf, Pb, P, Pm, Eu, Gd, Dy, Ho, Er, Tm, Yb and Lu, and Z is selected from the group consisting of Ni, Pd, Cu, Ag and Au; and wherein, when j = 1, m = 0.01 to 1.0, n = 0.01 to 1.0, y = 0.01 to 1.0, z = 0.001 to 0.1 and o is dependent on the oxidation state of the other elements, said catalyst composition having been formed from calcining an admixture including catalyst precursors and a source of NO_x for improving catalytic performance.

10. The process according to claim 9, wherein said source of NO_x is selected from nitric acid, ammonium nitrate, ammonium nitrite, NO, NO_2 or a mixture thereof.

11. The process according to claim 9, wherein said source of NO_x is nitric acid.

12. An improved catalyst composition, comprising a mixed metal oxide having the empirical formula

$$J_jM_mN_nY_yZ_zO_o$$

wherein J is at least one element selected from the group consisting of Mo and W, M is at least one element selected from the group consisting of V and Ce, N is at least one element selected from the group consisting of Te, Sb and Se, Y is at least one element selected from the group consisting of Nb, Ta, Ti, Al, Zr, Cr, Mn, Fe, Ru, Co, Rh, Ni, Pt, Sb, Bi, B, In, As, Ge, Sn, Li, Na, K, Rb, Cs, Fr, Be, Mg, Ca, Sr, Ba, Ra, Hf, Pb, P, Pm, Eu, Gd, Dy, Ho, Er, Tm, Yb and Lu, and Z is selected from the group consisting of Ni, Pd, Cu, Ag and Au; and wherein, when j = 1, m = 0.01 to 1.0, n = 0.01 to 1.0, y = 0.01 to 1.0, z = 0.001 to 0.1 and o is dependent on the oxidation state of the other elements;

wherein said catalyst composition has been treated to exhibit peaks at X-ray diffraction angles (2θ) of 22.1°, 27.1°, 28.2°, 36.2°, 45.2°, and 50.0°, with a relative increase in a diffraction peak at said diffraction angle (2θ) of 27.1 degrees when compared with an untreated catalyst of like empirical formula.